

ABSTRACT OF THE INVENTION

The present invention is directed to nucleic acids encoding glycosyltransferases, the proteins encoded thereby, and to methods for synthesizing oligosaccharides using the glycosyltransferases of the invention. In particular, the present

5 application is directed to identification a glycosyltransferase locus of *Neisseria gonorrhoeae* containing five open reading frames for five different glycosyltransferases. The functionally active glycosyltransferases of the invention are characterized by catalyzing reactions such as adding Gal  $\beta 1 \rightarrow 4$  to GlcNAc or Glc; adding GalNAc or GlcNAc  $\beta 1 \rightarrow 3$  to Gal; and adding Gal  $\alpha 1 \rightarrow 4$  to Gal. The  
= 10 glycosyltransferases of the invention are particularly suited to the synthesis of the oligosaccharides Gal $\beta 1 \rightarrow 4$ GlcNAc $\beta 1 \rightarrow 3$ Gal $\beta 1 \rightarrow 4$ Glc (a mimic of lacto-N-neotetraose), GalNAc $\beta 1 \rightarrow 3$ Gal $\beta 1 \rightarrow 4$ GlcNAc $\beta 1 \rightarrow 3$ Gal $\beta 1 \rightarrow 4$ Glc $\beta 1 \rightarrow 4$  (a mimic ganglioside), and Gal $\alpha 1 \rightarrow 4$ Gal $\beta 1 \rightarrow 4$ Glc $\beta 1 \rightarrow 4$ Hep $\rightarrow$ R (a mimic of the saccharide portion of globo-glycolipids).